Abstract Submitted
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Progress Toward a Two-Photon Optical Atomic Clock in Neutral Silver[1] DAVID MCKENNA, CAROL TANNER, University of Notre Dame — Bender et al.[2] proposed Ag as an optical frequency standard. There are two narrow two-photon transitions 4d105s 2S1/2-4d95s2 2D5/2 (two 661nm photons) and 4d105s 2S1/2-4d95s2 2D3/2 (two 576nm photons) from the ground state. An advantage over single-photon optical clocks is that two equal counter-propagating photons will cancel the first order Doppler shift. The 4d95s2 2D3/2 state (width 4kHz) decays by two single photon emissions to the ground state via easily detectable photons at 338nm or 328nm. The 4d95s2 2D5/2 clock state is metastable (width[3] 0.8Hz) and decays via an electric quadrupole transition at 330.6nm. Our first goal is to observe excitation and decay of the 4d95s2 2D3/2 state in an atomic beam yielding optical frequencies for all hyperfine components in both 107, 109Ag. Our second goal is to observe excitation and decay of the clock state. We expect to achieve an atomic number density in the interaction region of 1010/cm3 at an oven temperature of ∼1300K. For a laser beam waist of 1cm, the transit-time-limited line width is ∼45kHz. One might expect a precision of ∼45Hz or 1/1013 in a measurement of the optical frequencies.

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[2]P. L. Bender et al., Bull. Am. Phys. Soc. 21, 599 (1976).
[3]R. H. Garstang, J. Res. Natl. Bur. Stand. Sect. A 68, 61 (1964).

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